



Most Reliable Quality	High Availability	Modular System
<ul style="list-style-type: none"> • 98 % efficiency • Converter are designed for a lifetime of > 20 years • Use of high-quality components from well-known European manufacturers • Quality „Made in Germany“ 	<ul style="list-style-type: none"> • Easy maintenance • Long operating life due to robust design • Worldwide and long-term availability of spare parts 	<ul style="list-style-type: none"> • Hybrid-Converter-Concept enables integration of additional energy sources / consumers • Black Start Capability • Flexible and easy customization

FREQCON Converter System with Hybrid Concept

Flexible MSC for many applications

The FREQCON Multi-Source Converter (MSC) is a Hybrid Converter. It is a technological breakthrough in today's Microgrid and Hybrid energy market. Multiple energy sources (wind, PV, batteries, fuel cells etc.) can be connected to one common DC-link of the FREQCON MSC, thus reducing investment and installation costs, increasing the overall efficiency and achieving a higher level of system integration.

With FREQCON's reliable, robust and fully integrated Energy Management System (EMS), any project specific energy management strategy can be implemented. The FREQCON MSC is an on-grid and off-grid converter equipped with the capability of stabilizing the grid by active frequency and voltage support. It is compatible with almost all market available energy storage technologies such as lithium-ion, lead-acid or redox-flow batteries. With its multi-source converter technology, multiple storage technologies can also be connected in parallel with the same converter. Our MSC is conform to all common grid codes.

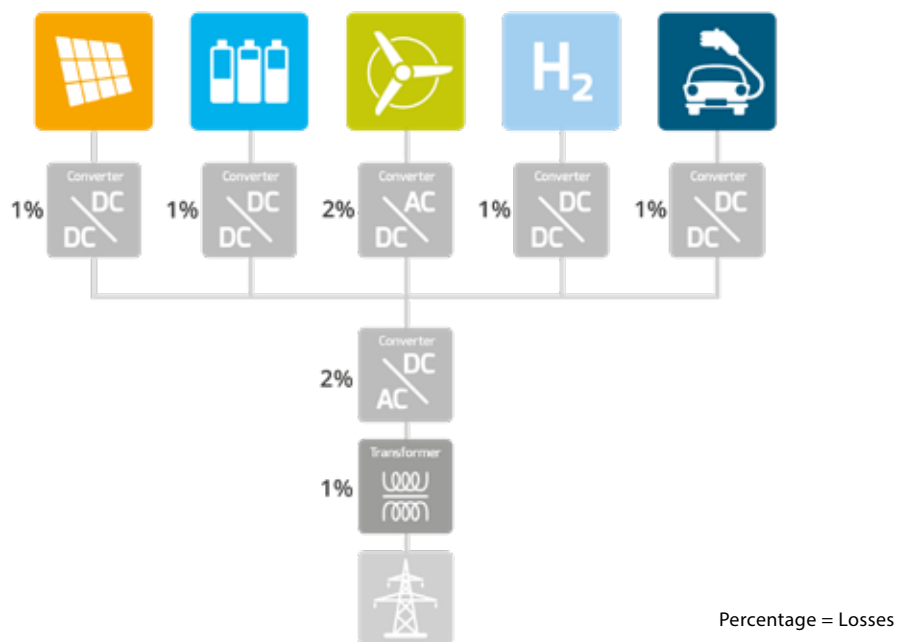
With a design life of 20 years, integrated with project adapted medium-voltage components and packed inside a standardized 20 ft, 30 ft or 40 ft container, FREQCON MSC offers an ultimate solution for worldwide Hybrid and Microgrid project applications. When it comes to Hybrid or Microgrid projects with storage and grid stabilization applications, our FREQCON MSC is unmatched in quality and flexibility! The power range of our conveter is modularly scalable from 175 kW to 3 MW up to multi-megawatt plants in compliance with all required grid codes.

APPLICATIONS

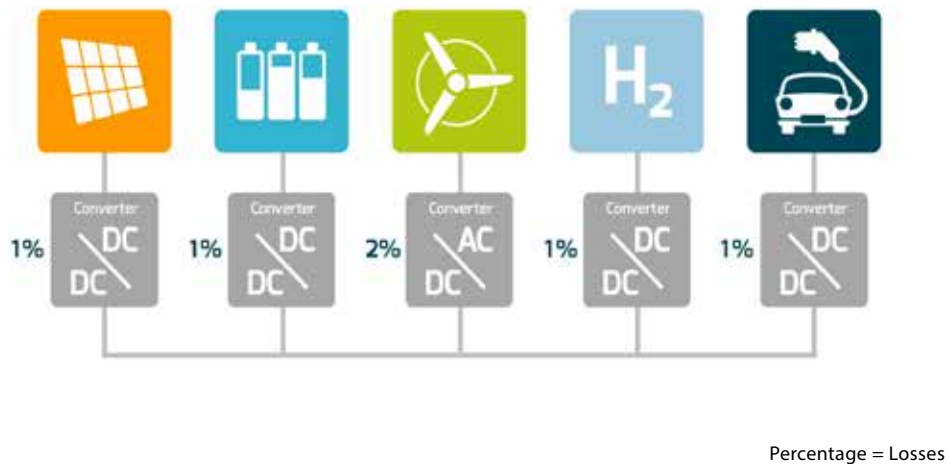
Our solutions allow an efficient and reliable use for various applications:

- Peak shaving
- Peak shifting
- Uninterruptible power supply (UPS)
- Active harmonic filter
- Hybrid applications
- Energy arbitrage / Daytrading
- Grid services
- Black start capability
- Island grid operation
- Dynamic voltage control
- Reactive power compensation
- Voltage dip mitigation
- Primary control reserve (PCR) / Frequency containment reserve (FCR)
- Frequency control
- Grid forming
- Synthetic inertia

SYSTEM DIAGRAMS



Hybrid Converter System with DC coupling - grid connection



Hybrid Converter System with DC coupling - microgrid solution

Multi-Source Converter (MSC)

400 V / 175 kVA up to 1300 kVA



Technical Data	FREQCON Hybrid Converter					
	MSC 175	MSC 350	MSC 520	MSC 700	MSC 1030	MSC 1300
Nominal AC voltage	400 V	400 V	400 V	400 V	400 V	400 V
Nominal power	175 kW	350 kW	520 kW	700 kW	1030 kW	1300 kW
Nominal current	253 A	505 A	751 A	1010 A	1487 A	1876 A
Maximum AC current	262,5 A	525 A	787,5 A	1050 A	1575 A	1890 A
AC power frequency	50 Hz (47 Hz ... 53 Hz) / 60 Hz (57 Hz ... 63 Hz)					
IGBT switching frequency	2 ... 4 kHz					
Power factor at rated power / displacement power factor adjustable	1 / 0.00 overexcited to 0.03 underexcited					
DC link voltage	850 V _{DC}					
Number of DC outputs	Flexible from 1 to 6 available					
DC current outputs	250, 500, 750, 1000, 1500 and 1800 A available					
DC voltage range	50 V _{DC} to 1500 V _{DC}					
Max. DC voltage	1500 V _{DC}					
Main controller	Siemens Simotion P320-4					
Control software	FREQCON Framework					
Standards and Certifications	Low Voltage Directive (NSRL) DIN EN 62109-1					
	EMV-Directive DIN EN 61000-6-2 and DIN EN 61000-6-4					
	VDE 4110, 4120, 4130					
Internal communication	Profinet IRT					
External communication interfaces	Ethernet, RS485, RS232, MODBUS TCP, Profibus, Profinet					
Max. THD	<3% at nominal power					
Efficiency AC to DC	98.3%					
Efficiency DC to DC	99.4%					
Cooling principle	liquid cooled					
Ambient temperature range	-20 °C to +40 °C					
Lifetime (rated conditions)	20 years					
Protection Devices						
Battery (DC)	fuse and DC load break switch					
AC side disconnection point	ACB					
DC overvoltage protection	surge arrester, type I					
AC overvoltage protection	surge arrester, class I					
Ground fault monitoring	yes					
Insulation monitoring at AC and DC	yes					
Fire protection	smoke and arc detection					



FREQCON MSC as container solution

Multi-Source Converter (MSC)

620 V / 250 kVA up to 3000 kVA



Technical Data	FREQCON Hybrid Converter						
	MSC 250	MSC 500	MSC 750	MSC 1000	MSC 1500	MSC 2000	MSC 3000
Nominal AC voltage	620 V	620 V	620 V	620 V	620 V	620 V	620 V
Nominal power	250 kW	500 kW	750 kW	1000 kW	1500 kW	2000 kW	3000 kW
Nominal current	233 A	466 A	698 A	931 A	1397 A	1862 A	2794 A
Maximum AC current	262,5 A	525 A	787,5 A	1050 A	1575 A	2100 A	3150 A
AC power frequency	50 Hz (47 Hz ... 53 Hz) / 60 Hz (57 Hz ... 63 Hz)						
IGBT switching frequency	2 ... 4 kHz						
Power factor at rated power / displacement power factor adjustable	1 / 0.00 overexcited to 0.03 underexcited						
DC link voltage	1150 V _{DC}						
Number of DC outputs	Flexible from 1 to 6 available						
DC current outputs	250, 500, 750, 1000, 1500 and 1800 A available						
DC voltage range	50 V _{DC} to 1500 V _{DC}						
Max. DC voltage	1500 V _{DC}						
Main controller	Siemens Simotion P320-4						
Control software	FREQCON Framework						
Standards and Certifications	Low Voltage Directive (NSRL) DIN EN 62109-1						
	EMV-Directive DIN EN 61000-6-2 and DIN EN 61000-6-4						
	VDE 4110, 4120, 4130						
Internal communication	Profinet IRT						
External communication interfaces	Ethernet, RS485, RS232, MODBUS TCP, Profibus, Profinet						
Max. THD	<3% at nominal power						
Efficiency AC to DC	98.3%						
Efficiency DC to DC	99.4%						
Cooling principle	liquid cooled						
Ambient temperature range	-20 °C to +40 °C						
Lifetime (rated conditions)	20 years						
Protection Devices							
Battery (DC)	fuse and DC load break switch						
AC side disconnection point	ACB						
DC overvoltage protection	surge arrester, type I						
AC overvoltage protection	surge arrester, class I						
Ground fault monitoring	yes						
Insulation monitoring at AC and DC	yes						
Fire protection	smoke and arc detection						



FREQCON MSC as container solution, inside view